

CLAIMS

## WHAT IS CLAIMED IS:

- 5           1.     A poly(trimethylene-ethylene ether) glycol.
2.     The poly(trimethylene-ethylene ether) glycol as claimed in  
claim 1, prepared by the polycondensation of 1,3-propanediol reactant  
and ethylene glycol reactant.
- 10           3.     The poly(trimethylene-ethylene ether) glycol as claimed in  
claim 2, wherein the polycondensation is carried out with an acid  
polycondensation catalyst.
- 15           4.     The poly(trimethylene-ethylene ether) glycol as in claim 3,  
wherein the polycondensation catalyst is homogeneous.
5.     The poly(trimethylene-ethylene ether) glycol as in claim 4,  
wherein the polycondensation catalyst comprises sulfuric acid.
- 20           6.     The poly(trimethylene-ethylene ether) glycol as claimed in  
claim 1, prepared by acid catalyzed polycondensation of 1,3-  
propanediol and ethylene glycol.
- 25           7.     The poly(trimethylene-ethylene ether) glycol as claimed in  
claim 5, prepared by acid catalyzed polycondensation of 1,3-  
propanediol and ethylene glycol.
- 30           8.     The poly(trimethylene-ethylene ether) glycol as claimed in  
claim 1, prepared by acid catalyzed polycondensation of about 50 to  
about 99 mole % 1,3-propanediol and about 50 to about 1 mole %  
ethylene glycol.

9. The poly(trimethylene-ethylene ether) glycol as claimed in claim 1, prepared by acid catalyzed polycondensation of about 60 to about 98 mole % 1,3-propanediol and about 40 to about 2 mole % ethylene glycol.

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10. The poly(trimethylene-ethylene ether) glycol as claimed in claim 1, prepared by acid catalyzed polycondensation of about 70 to about 98 mole % 1,3-propanediol and about 30 to about 2 mole % ethylene glycol.

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11. The poly(trimethylene-ethylene ether) glycol of claim 2, wherein the 1,3-propanediol reactant is selected from the group consisting of 1,3-propanediol, and oligomers of 1,3-propanediol having a degree of polymerization of 2 to 3, and mixtures thereof.

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12. The poly(trimethylene-ethylene ether) glycol of claim 7, wherein the 1,3-propanediol reactant is selected from the group consisting of 1,3-propanediol, and oligomers of 1,3-propanediol having a degree of polymerization of 2 to 3, and mixtures thereof.

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13. The poly(trimethylene-ethylene ether) glycol of claim 2, wherein the ethylene glycol reactant is selected from the group consisting of ethylene glycol, and oligomers of ethylene glycol having a degree of polymerization of 3 to 4, and mixtures thereof.

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14. The poly(trimethylene-ethylene ether) glycol of claim 2, wherein the ethylene glycol reactant is selected from the group consisting of ethylene glycol, and oligomers of ethylene glycol having a degree of polymerization of 3 to 4, and mixtures thereof.

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15. The poly(trimethylene-ethylene ether) glycol of claim 11, wherein the ethylene glycol reactant is selected from the group consisting of ethylene glycol, and oligomers of ethylene glycol having a degree of polymerization of 3 to 4, and mixtures thereof.

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16. The poly(trimethylene-ethylene ether) glycol of claim 2, wherein the 1,3-propanediol reactant is 1,3-propanediol.

17. The poly(trimethylene-ethylene ether) glycol of claim 16, the 1,3-propanediol is derived from either a petrochemical or a renewable source.

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18. The poly(trimethylene-ethylene ether) glycol of claim 2, wherein the ethylene glycol reactant is ethylene glycol.

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19. The poly(trimethylene-ethylene ether) glycol of claim 16, wherein the ethylene glycol reactant is ethylene glycol.

20. The poly(trimethylene-ethylene ether) glycol of claim 1, having a number average molecular weight (Mn) of 250 to about 10,000.

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21. The poly(trimethylene-ethylene ether) glycol of claim 1, having a number average molecular weight (Mn) of at least about 1,000 to about 5,000.

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22. A poly(trimethylene-ethylene ether) glycol as claimed in claim 1, prepared by a process comprising the steps of:

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(a) providing (1) 1,3-propanediol reactant, (2) ethylene glycol reactant and (3) acid polycondensation catalyst; and

(b) polycondensing the 1,3-propanediol and ethylene glycol reactants in the presence of the acid polycondensation catalyst to form poly(trimethylene-ethylene ether) glycol.

5           23. A poly(trimethylene-ethylene ether) glycol as claimed in claim 1, prepared by a continuous process comprising:

(a) continuously providing (i) 1,3-propanediol reactant, (ii) ethylene glycol reactant and (iii) acid polycondensation catalyst; and

10           (b) continuously polycondensing the 1,3-propanediol and ethylene glycol reactants in the presence of the acid polycondensation catalyst to form poly(trimethylene-ethylene ether) glycol.

15           24. A poly(trimethylene-ethylene ether) glycol as claimed in claim 1, prepared by a semi-continuous process comprising the steps of:

(a) batch polycondensing 1,3-propanediol reactant in the presence of acid polycondensation catalyst; and

20           (b) adding ethylene glycol reactant to the batch polycondensing over time.

25           25. A process comprising:

(a) providing (1) 1,3-propanediol reactant, (2) ethylene glycol reactant and (3) acid polycondensation catalyst; and

(b) polycondensing the 1,3-propanediol and ethylene glycol reactants in the presence of the acid polycondensation catalyst to form poly(trimethylene-ethylene ether) glycol.

26. A process comprising:  
(a) continuously providing (i) 1,3-propanediol reactant, (ii) ethylene glycol reactant and (iii) acid polycondensation catalyst; and  
5 (b) continuously polycondensing the 1,3-propanediol and ethylene glycol reactants in the presence of the acid polycondensation catalyst to form poly(trimethylene-ethylene ether) glycol.
- 10 27. A process comprising:  
(a) batch polycondensing 1,3-propanediol reactant in the presence of acid polycondensation catalyst; and  
(b) adding ethylene glycol reactant to the batch  
15 polycondensing over time.
28. A composition comprising poly(trimethylene-ethylene ether) glycol and additive.
- 20 29. The composition of claim 28, wherein the additive comprises at least one each of at least one of delustrant, colorant, stabilizer, filler, flame retardant, pigment, antimicrobial agent, antistatic agent, optical brightener, extender, processing aid, viscosity booster and mixtures thereof.
- 25 30. The composition of claim 1, used in at least one of breathable membranes, synthetic lubricants, hydraulic fluids, cutting oils, motor oils, surfactants, spin-finishes, water-borne coatings, laminates, adhesives, packaging, films and foams, fibers and fabrics.
- 30 31. The composition of claim 1, which is a block copolymer of polyethylene oxide and polytrimethylene oxide.

32. The composition of claim 31, having a molecular weight of at least about 1,000.

5 33. The composition of claim 31, having a molecular weight of at least about 5,000.

34. The composition of claim 31, having a molecular weight of up to about 20,000.

10 35. The composition of claim 32, having a molecular weight of up to about 20,000.

15 36. The composition of claim 31, having a molecular weight up to about 10,000.

37. The composition of claim 31, wherein the weight % of polyethylene glycol is at least about 10%, based on the total amount of polyethylene glycol and polytrimethylene glycol.

20 38. The composition of claim 37, wherein the weight % of polyethylene glycol is up to about 70%, based on the total amount of polyethylene glycol and polytrimethylene glycol.

25 39. The composition of claim 31, used in at least one of breathable membranes, lubricants, surfactants, spin-finishes, water-borne coatings, laminates, adhesives, packaging, films and foams.